Chapter 3:
Patterns, Relations, Equations and Predictions

- Describing Patterns
- Solving Equations (algebra)
- y = mx + b

Section 3.1 - Describing Patterns

Curriculum Outcomes	Related Activities	Page in Text
• express problems in terms of equations and vice versa • model real-world phenomena with linear, quadratic, exponential, and power equations • gather data, plot the data using appropriate scales, and demonstrate an understanding of independent and dependent variables and domain and range • construct and analyze tables relating two variables • develop and apply strategies for solving problems • describe real-world relationships depicted by graphs and tables of values • identify, generalize, and apply patterns • solve problems using graphing technology • determine if a graph is linear by plotting points in a given situation	• investigations on gathering data about visible faces on cube "trains" • a Focus on graphing data and using data to make predictions • develop an equation in the form ax + b = c • demonstrate and apply an understanding of discrete and continuous number systems	96 97 98 101

THE NUMBER SYSTEM

W =	Whole Numbers	I =	Integers
$\overline{Q}$ =	Irrational Numbers	R =	Real Numbers
N =	Natural Numbers	Q =	Rational Numbers

EXAMPLES:

W: 0, 1, 2, 3,.....

$\overline{Q}$: π (3.141592...), $\sqrt{3}$, 1.23456738... , $\sqrt{15}$, ...

N: 1, 2, 3,.....

I: .....-3, -2, -1, 0, 1, 2, 3, ...

R: $-\frac{1}{2}$, $\sqrt{15}$, 0 , -3 , 3 , π (3.141592) , ...

Q: $\frac{1}{2}$, $-\frac{1}{2}$, $\frac{11}{3}$, 0.2 , -0.2 , 3 , -3 , 0 , ...

- Definitions

- Real numbers (R): ALL numbers; rational & irrational
- Irrational numbers ($\overline{Q}$):
  - -they cannot be written as a fraction
  - -non-repeating decimal
  - -non-terminating decimal
  - -Examples: 0.2163875943.... and π
- Rational numbers (Q):
  - -a number that can be written as a fraction
  - -Any number that is not an irrational number
  - -Examples: -2.34, $3.\overline{456}$, 6.323 232 32...

Definitions continued...

- Integers (I):
  - -Positive and negative whole numbers
  - -NO decimals
  - -Examples: -400, +8, 0, 29, -49578
- Whole numbers (W):
  - -all of the positive integers and zero
  - -Examples: 0, 1, 2, 3, 4, etc.
  - -NO decimals
- Natural numbers (N):
  - -all of the positive integers
  - -DOES NOT include zero (only difference from whole numbers)
  - -Examples: 1, 2, 3, 4, etc.

Using the previous definitions, determine if the following statements are sometimes true, always true, or never true. Justify your choices.

A) All whole numbers are integers Always

B) All integers are whole numbers Sometimes
-1, 0, 1

C) If a number is an integer then it is also a rational number. Always

D) If a number is a rational number then it is also an integer. Sometimes
4 3.2

E) There is a number which is both rational and irrational.
Never

Copy and complete the table:

For each of the following numbers in the table, put an "x" in each category that the number belongs to. It may only belong in one, but could also belong to 5 out of the 6 categories. The first one is done for you.

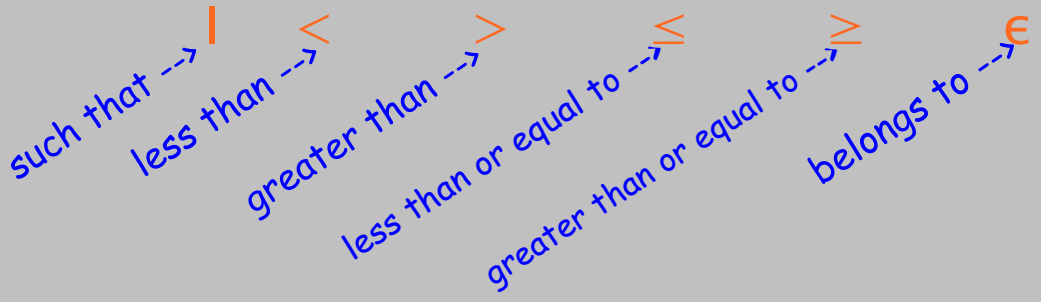
Number	Real	Rational	Irrational	Whole	Natural	Integer
3.2	x	x				
0						
5.66						
-7						
15						
20009						
4.569...						
3.14...						
-3.22						
4/5						
14/2						
-6/3						
5/2						
-4.567...						
-23						
10						

Please double check your answers to make sure that you marked the appropriate boxes.

Number	Real	Rational	Irrational	Whole	Natural	Integer
3.2	X	X				
0	X	X		X		X
5.66	X	X				
-7	X	X				X
15	X	X		X	X	X
20009	X	X		X	X	X
4.569...	X		X			
3.14...	X		X			
-3.22	X	X				
4/5	X	X				
14/2	X	X		X	X	X
-6/3	X	X				X
5/2	X	X				
-4.567...	X		X			
-23	X	X				X
10	X	X		X	X	X

Set Notation:

- We need to know what these signs mean:



- We need to know what number type we are dealing with:

Natural Number = N	Rational Numbers = Q
Whole Numbers = W	Irrational Numbers = $\overline{Q}$
Integer = I	Real Numbers = R

- Example:

$$\{ x \mid x \leq 5, x \in I \}$$

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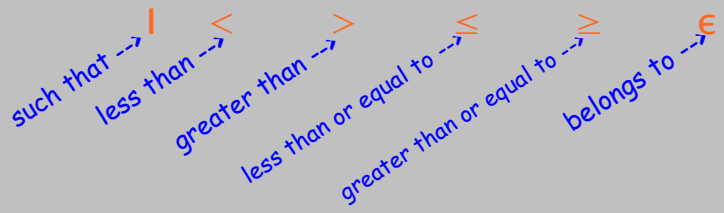

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Natural Number = N	Rational Numbers = Q
Whole Numbers = W	Irrational Numbers = $\overline{Q}$
Integer = I	Real Numbers = R

- Example:

$$\{ x \mid x \leq 5, x \in I \}$$

Variable (x)

x is less than or equal to 5

x belongs to Intergers

Possible answers: 4, 5, 3, 0, -2

What if we were to graph this on a number line?

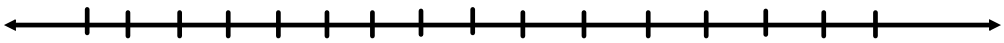
Ask Yourself:

- What set of numbers am I dealing with?
- What is the sign?: am I going right or left?
- Dots or a line?:

Dots	Lines
Integers	Real
Natural	Irrational
Whole	Rational

- Solid or open dots?:
  - Solid - if it can be equal to
  - Open - If that number isn't included

$$\{ x \mid x \leq 5, x \in I \}$$



Attachments

Domain, Range, Continuous & Discrete worksheet #2.doc